

## CLAIMS

1. A semiconductor device comprising:  
an electrode;  
5 a top region of a second conductivity type connected to the electrode;  
a deep region of the second conductivity type;  
an intermediate region of a first conductivity type connected to the  
electrode, the intermediate region isolating the top region and the deep region;  
a gate electrode facing a portion of the intermediate region via an  
10 insulating layer, the portion of the intermediate region isolating the top region  
and the deep region; and  
a barrier region formed within the intermediate region and/or the top  
region.
- 15 2. A semiconductor device according to claim 1,  
wherein the intermediate region comprises a dense portion directly  
connected to the electrode, and a main portion connected to the electrode via the  
dense portion.
- 20 3. A semiconductor device according to claim 2,  
wherein the top region is an emitter, the dense portion is a body contact,  
the main portion is a body, the deep region is a drift, and the semiconductor  
device is an IGBT.
- 25 4. A semiconductor device according to any one of the preceding claims,  
wherein the barrier region comprises a semiconductor region of the  
second conductivity type, this being electrically disconnected from the electrode  
and the deep region.
- 30 5. A semiconductor device according to claim 4,

wherein the barrier region is connected to the insulating layer, and the barrier region has an opening through which carriers may flow between the dense portion and the deep region.

5     6.     A semiconductor device according to any one of the preceding claims,  
         wherein the barrier region comprises an insulator.

7.     A semiconductor device according to any one of the preceding claims,  
         wherein the barrier region comprises a semiconductor region of the first  
10    conductivity type having a higher concentration of impurities than the main  
         portion, the semiconductor region having the higher concentration of impurities  
         being formed along a boundary between the top region and the main portion and  
         being electrically connected to the dense portion.

15    8.     A semiconductor device according to any one of claims 2 to 7,  
         wherein the barrier region is formed in the vicinity of a boundary  
         between the dense portion and the main portion,  
         the semiconductor device further comprising an additional barrier region  
         of the second conductivity type formed in the vicinity of a boundary between the  
20    main portion and the deep region, the additional barrier region being electrically  
         disconnected from the electrode and the deep region.

9.     A semiconductor device according to any one of claims 2 to 8,  
         wherein the barrier region is formed in the vicinity of a boundary  
25    between the dense portion and the main portion,  
         the semiconductor device further comprising an additional barrier region  
         of the second conductivity type formed in the vicinity of a boundary between the  
         main portion and the deep region, the additional barrier region having a higher  
         concentration of impurities than the deep region.

10. A semiconductor device according to claim 8 or 9,  
wherein at least a portion of the barrier region and a portion of the  
additional barrier region are located on a path along which carriers flow.

5 11. A semiconductor device according to any one of the preceding claims,  
wherein a plurality of barrier regions is formed within the intermediate  
region, the barrier regions being distributed within the intermediate region.

12. A semiconductor device according to claim 11,  
10 wherein a plurality of pairs of barrier layer and intermediate layer is  
stacked.

13. A semiconductor device according to any one of the preceding claims,  
wherein the barrier region is connected to the dense portion.

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14. A semiconductor device according to any one of the preceding claims,  
wherein the thickness of the top region is less than the thickness of the  
barrier region.

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